

CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. A power supply apparatus, comprising:

an input terminal having an input voltage applied thereto from a direct current power source;

an output voltage generator configured to generate a constant output voltage based on said input voltage;

an output terminal of said output voltage generator outputting said constant output voltage;

a reference voltage generator configured to generate a reference voltage;

a voltage divider having an output point, said voltage divider configured to accept said constant output voltage from said output terminal of said output voltage generator and further configured to divide said constant output voltage into a divided voltage in accordance with a voltage dividing ratio which is variable in response to an externally-input control signal and to output said divided voltage to said output point of said voltage divider; and

a voltage control circuit configured to control said output voltage generator to regulate said constant output voltage such that said divided voltage from said voltage divider is equalized to said reference voltage.

2. The power supply apparatus as defined in Claim 1, wherein said voltage divider comprises:

a first resistor circuit including a plurality of resistors connected in series between said output terminal and said output point of said voltage divider;

a first switch circuit configured to make a short circuit in at least one of said plurality of resistors included in said first resistor circuit in response to an input control signal;

a second resistor circuit including a plurality of resistors;

a second switch circuit configured to connect in parallel at least one of said plurality of resistors included in said second resistor circuit between said output point of said voltage divider and a common ground of said direct current power source in response to said input control signal; and

a switch control circuit configured to generate said input control signal in response to said externally-input control signal and to control said first and second switch circuits with said input control signal to change the voltage dividing ratio.

3. The power supply apparatus as defined in Claim 1, wherein said voltage divider comprises:

a first resistor circuit including a plurality of resistors;

a first switch circuit configured to connect in parallel at least one of said plurality of resistors included in said first resistor circuit between said output terminal and said output point of said voltage divider in response to an input control signal;

a second resistor circuit including a plurality of resistors connected in series between said output point of said voltage divider and a common ground of said direct current power source;

a second switch circuit configured to make a short circuit in at least one of said plurality of resistors included in said second resistor circuit in response to said input control signal; and

a switch control circuit configured to generate said input control signal in response to said externally-input control signal and to control said first and second switch circuits with said input control signal to change the voltage dividing ratio.

4. The power supply apparatus as defined in Claim 1, wherein said output voltage generator includes a switching transistor performing a switching operation for outputting the input voltage applied by the direct current power source in accordance with a control signal from said voltage control circuit, wherein said voltage control circuit comprises:

an error amplifier amplifying an error of said divided voltage output from said output point of said voltage divider relative to said reference voltage;

a control circuit configured to generate said control signal in accordance with an output signal from said error amplifier to control said switching operation of said switching transistor; and

a smoothing circuit configured to smooth an output signal from said switching transistor and to output said smoothed output signal to said output terminal.

5. The power supply apparatus as defined in Claim 4, wherein said reference voltage generator, said voltage divider, said error amplifier, and said control circuit are integrated into a single integrated circuit.

6. The power supply apparatus as defined in Claim 4, wherein said reference voltage generator, said switching transistor, said voltage divider, said error amplifier, and said control circuit are integrated into a single integrated circuit.

7. The power supply apparatus as defined in Claim 4, wherein said smoothing circuit includes a transistor which is operated and controlled by said control circuit to function as a flywheel diode, and said transistor, said switching transistor, said voltage divider, said switching transistor, said error amplifier, and said control circuit are integrated into a single integrated circuit.

8. The power supply apparatus as defined in Claim 1, wherein said output voltage generator includes an output control transistor controlling an output of a current applied by the direct current power source in accordance with a control signal from said voltage control circuit, wherein said voltage control circuit comprises an error amplifier controlling an operation of said output control transistor such that said divided voltage of said voltage divider is equalized to said reference voltage.

9. The power supply apparatus as defined in Claim 8, wherein said reference voltage generator, said voltage divider, and said error amplifier are integrated into a single integrated circuit.

10. The power supply apparatus as defined in Claim 8, wherein said reference voltage generator, said voltage divider, said error amplifier, and said output control transistor are integrated into a single integrated circuit.

11. A power supply apparatus, comprising:

input terminal means for having an input voltage applied thereto from a direct current power source;

output voltage generating means for generating a constant output voltage based on said input voltage;

output terminal means for outputting said constant output voltage;

reference voltage generating means for generating a reference voltage;

voltage dividing means for receiving said constant output voltage from said output terminal means and for dividing said constant output voltage into a divided voltage in accordance with a voltage dividing ratio which is variable in response to an externally-input control signal and for outputting said divided voltage; and

voltage controlling means for controlling said output voltage generating means to regulate said constant output voltage such that said divided voltage from said voltage dividing means is equalized to said reference voltage.

12. The power supply apparatus as defined in Claim 11, wherein said voltage dividing means comprises:

- a first resistor circuit including a plurality of resistors connected in series between said output terminal means and said output point of said voltage dividing means;

- a first switch circuit configured to make a short circuit in at least one of said plurality of resistors included in said first resistor circuit in response to an input control signal;

- a second resistor circuit including a plurality of resistors;

- a second switch circuit configured to connect in parallel at least one of said plurality of resistors included in said second resistor circuit between said output point of said voltage dividing means and a common ground of said direct current power source in response to said input control signal; and

- a switch control circuit configured to generate said input control signal in response to said externally-input control signal and to control said first and second switch circuits with said input control signal to change the voltage dividing ratio.

13. The power supply apparatus as defined in Claim 11, wherein said voltage dividing means comprises:

- a first resistor circuit including a plurality of resistors;

- a first switch circuit configured to connect in parallel at least one of said plurality of resistors included in said first resistor circuit between said output terminal and said output point of said voltage dividing means in response to an input control signal;

a second resistor circuit including a plurality of resistors connected in series between said output point of said voltage dividing means and a common ground of said direct current power source;

a second switch circuit configured to make a short circuit in at least one of said plurality of resistors included in said second resistor circuit in response to said input control signal; and

a switch control circuit configured to generate said input control signal in response to said externally-input control signal and to control said first and second switch circuits with said input control signal to change the voltage dividing ratio.

14. The power supply apparatus as defined in Claim 11, wherein said output voltage generating means includes switching means for performing a switching operation for outputting the input voltage applied by the direct current power source in accordance with a control signal from said voltage controlling means, and said voltage controlling means comprises:

error amplifying means for amplifying an error of said divided voltage output from said output point of said voltage dividing means relative to said reference voltage;

controlling means for generating said control signal in accordance with an output signal from said error amplifying means to control said switching operation of said switching means; and

smoothing means for smoothing an output signal from said switching means and to output said output signal to said output terminal means.

15. The power supply apparatus as defined in Claim 14, wherein said reference voltage generating means, said voltage dividing means, said error amplifying means, and said controlling means are integrated into a single integrated circuit.

16. The power supply apparatus as defined in Claim 14, wherein said reference voltage generating means, said switching means, said voltage dividing means, said error amplifying means, and said controlling means are integrated into a single integrated circuit.

17. The power supply apparatus as defined in Claim 14, wherein said smoothing means includes a transistor which is operated and controlled by said controlling means to function as a flywheel diode, and said transistor, said switching means, said voltage dividing means, said smoothing means, said error amplifying means, and said controlling means are integrated into a single integrated circuit.

18. The power supply apparatus as defined in Claim 11, wherein said output voltage generating means includes an output control transistor controlling an output of a current applied by the direct current power source in accordance with a control signal from said voltage controlling means, and said voltage controlling means comprises error amplifying means for controlling an operation of said output control transistor such that said divided voltage of said voltage dividing means is equalized to said reference voltage.

19. The power supply apparatus as defined in Claim 18, wherein said reference voltage generating means, said voltage dividing means, and said error amplifying means are integrated into a single integrated circuit.

20. The power supply apparatus as defined in Claim 18, wherein said reference voltage generating means, said voltage dividing means, said error amplifying means, and said output control transistor are integrated into a single integrated circuit.

21. A power supply apparatus, comprising:

- an input voltage from a direct current power source applied to an input terminal;
- a reference voltage generator for generating a reference voltage;

an output control transistor for outputting a constant output voltage to an output terminal in accordance with a voltage input to a gate of said output control transistor; and

a voltage divider having an output point, said voltage divider configured to accept said constant output voltage from said output terminal of said output voltage generator and further configured to divide said constant output voltage into a divided voltage in accordance with a voltage dividing ratio which is variable in response to an external-input control signal and output said divided voltage to said output point of said voltage divider.

22. The power supply apparatus as defined in claim 21, further comprising an error amplifier amplifying an error between said divided voltage output from said output point of said voltage divider and said reference voltage.

23. The power supply apparatus as defined in claim 21, further comprising a capacitor for stabilizing said constant output voltage through said output terminal, said capacitor coupled to ground and further coupled to said constant output voltage via said output control transistor.

24. A method of operating a power supply apparatus comprising:

- applying an input voltage from a direct current power source;
- outputting a constant output voltage based on said input voltage;
- generating a reference voltage;
- dividing said constant output voltage in accordance with a voltage dividing ratio in response to an external-input control signal to produce a divided voltage; and
- regulating said constant output voltage such that said divided voltage is equalized to said reference voltage.

25. The method as defined in claim 24, further comprising:

amplifying an error between said divided voltage and said reference voltage; and

generating a control signal based on said amplified error, said control signal controlling said act of regulating.

26. The method as defined in claim 25, further comprising smoothing said regulated constant output voltage.